Chapter 4
Covered Activities and Associated Federal Actions

Contents

Chapter 4 Covered Activities and Associated Federal Actions 4-1
4.1 Introduction 4-1
4.1.1 History and Overview of the SWP and CVP 4-2
4.1.1.1 SWP 4-2
4.1.1.2 CVP 4-3
4.1.2 Overview of Covered Activities and Associated Federal Actions 4-4
4.1.3 New Water Facilities Construction, Operations, and Maintenance 4-5
4.1.3.1 Tunnel/Pipeline Facility Construction and Operations 4-5
4.1.3.1.1 Background 4-5
4.1.3.1.2 Conveyance Facilities Maintenance Activities 4-9
4.1.3.2 Fremont Weir and Yolo Bypass Improvements and Maintenance 4-11
4.1.3.2.1 Background 4-11
4.1.3.3 North Bay Aqueduct Alternative Intake Project 4-13
4.1.3.3.1 Background 4-13
4.1.4 Operations and Maintenance of SWP Facilities 4-13
4.1.4.1 Clifton Court Forebay 4-14
4.1.4.2 Harvey O. Banks Pumping Plant 4-14
4.1.4.3 John E. Skinner Delta Fish Protective Facility 4-14
4.1.4.4 Barker Slough Pumping Plant and North Bay Aqueduct 4-15
4.1.4.5 New North Delta Intakes 4-15
4.1.4.6 Intake Pumping Plant 4-15
4.1.4.7 Intermediate Forebay 4-16
4.1.4.8 Intermediate Pumping Plant 4-16
4.1.4.9 Tunnel 4-16
4.1.4.10 SWP Diversions 4-17
4.1.4.11 Temporary Barriers in the South Delta 4-17
4.1.4.12 Maintenance and Monitoring Activities 4-19
4.1.5 Nonproject Diversions 4-20
4.1.5.1.1 Background 4-20
4.1.5.1.2 Proposed BDCP Actions Relevant to the Cache Slough Diversions 4-21
4.1.6 Habitat Restoration, Enhancement, and Management Activities 4-23
4.1.6.1 Activities to Reduce Effects of Methylmercury Contamination 4-25
4.1.6.2 Activities to Reduce Predation and Other Sources of Direct Mortality 4-26
4.1.6.3 Adaptive Management and Monitoring Program 4-26
4.1.6.4 Other Conservation Actions 4-26
4.2 Federal Actions Associated with the BDCP 4-27
4.2.1 Delta Cross Channel 4-28
4.2.2 C.W. Jones Pumping Plant 4-28

4.2.3 Tracy Fish Collection Facility 4-29
4.2.4 Contra Costa Water District Diversion Facilities 4-29
4.2.4.1.1 Rock Slough Fish Screen 4-30
4.2.4.1.2 Los Vaqueros Reservoir Expansion Project 4-30
4.2.4.2 Covered Action 4-30
4.2.5 CVP Diversions 4-30
4.2.6 Associated Maintenance and Monitoring Activities 4-31
4.3 Joint Federal and Nonfederal Actions 4-32
4.3.1 Joint Point of Diversion Operations 4-32
4.3.2 Operations of New Water Intake and Conveyance Facilities 4-32
4.3.3 Transfers 4-33
4.3.4 Suisun Marsh Facilities Operations and Maintenance 4-33
4.4 References Cited 4-34
4.4.1 Printed References 4-34
4.4.2 Personal Communications 4-35

Tables

		Page
Table 4-1	Summary of Pipeline/Tunnel Conveyance Physical Characteristics	4-8
Table 4-2	Head of Old River Barrier Operations	4-19
Table 4-3	Summary of Intakes in Cache Slough Area	4-20
Table 4-4	Summary of Intake Capacity (cubic feet per second)	4-21
Table 4-5	Summary of Program Criteria for Diversion Screening	4-23
Table 4-6	Extent of Natural Communities and Habitat Types Conserved Over the Term of the BDCP	4-25

Figures

Figures appear at the end of the chapter.

Figure 4-1	BDCP Plan Area Location
Figure 4-2	CVP and SWP Facilities
Figure 4-3	Schematic Diagram of the Proposed North Delta Intake and Conveyance Facilities
Figure 4-4	Locations of the Proposed North Delta Intake and Conveyance Facilities
Figure 4-5	Cache Slough Restoration Areas with Intake Structures

Acronyms and Abbreviations

af	acre-feet
BA	biological assessment
Banks	Harvey O. Banks
BO	biological opinion
CCWD	Contra Costa Water District's
Central Valley Water Board	Central Valley Regional Water Quality Control Board
CESA	California Endangered Species Act
cfs	cubic feet per second
CIP	cast-in-place-
CM	Conservation Measure
COA	Coordinated Operations Agreement
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DFG	California Department of Fish and Game
DWR	Department of Water Resources
ESA	federal Endangered Species Act
ft/sec	foot per second
HCP	habitat conservation plan
HORB	Head of Old River Barrier
JPOD	Joint Points of Diversion
kV	kilovolt
mm	millimeters
msl	mean sea level
NCCP	natural community conservation plan
NCCPA	California Natural Community Conservation Planning Act
NDWA	North Delta Water Agency
NMFS	National Marine Fisheries Service
OCAP	Operations Criteria and Plan
OMR	Old and Middle San Joaquin River
Reclamation	Bureau of Reclamation
ROA	Restoration Opportunity Area
RPA	Reasonable Prudent Alternative
SCWA	Solano County Water Agency
Skinner Fish Facility	John E. Skinner Delta Fish Protective Facility
SR	State Route
SRCD	Suisun Resource Conservation District
State Water Board	California State Water Resources Control Board
SWP	State Water Project
USFWS	U.S. Fish and Wildlife Service

Chapter 4
Covered Activities and Associated Federal Actions

*[**Note to Reviewers**: This version of Chapter 4, Covered Activities, has been revised to address comments received from various parties, provide further detail regarding certain activities, and generally update the chapter to reflect progress made in the BDCP planning process. Certain approaches reflected in this draft, however, will be the subject of further evaluation and consideration by DWR, Reclamation and other BDCP participants. For instance, DWR and Reclamation will need to determine whether the chapter should distinguish between non-federal activities ("covered activities") and federal activities ("associated federal actions"), recognizing that the agencies will seek regulatory authorizations under different provisions of the ESA. In addition, further consideration will need to be given to the scope of coverage under the BDCP. In particular, the parties will need to determine whether water operations occurring under existing SWP/CVP infrastructure should be included as a covered activity. Reviewers should also note that detailed descriptions of certain covered activities, including the new north Delta diversions and conveyance infrastructure, will be provided in supporting and ancillary documents that are still under development. For those covered activities that also serve as conservation measures, additional detail will be provided in Chapter 3, Conservation Strategy, which is currently being revised.]*

4.1 Introduction

The BDCP is intended to provide the basis for the issuance of regulatory authorizations under the federal Endangered Species Act (ESA) and the California Natural Community Conservation Planning Act (NCCPA) for a broad range of ongoing and anticipated activities that are associated with the operations of the State Water Project (SWP) in the Sacramento-San Joaquin River Delta (Figure 4-1). This chapter identifies and describes the activities that are addressed by the BDCP. The chapter further categorizes these activities on the basis of the party chiefly responsible for their implementation, characterizing activities as either *covered activities* for those actions undertaken by nonfederal parties or as *associated federal actions* for those actions that are authorized, funded, or carried out by the Bureau of Reclamation (Reclamation). With regard to the latter actions, the BDCP is intended to provide the basis for an ESA Section 7 consultation by Reclamation.

The potential effects of all of these activities on covered species, their habitats, and natural communities have been evaluated as part of an overall assessment of the effects of the BDCP, as described in Chapter 5, *Effects Analysis*. All construction and maintenance activities included as covered activities and actions will comply with the avoidance and minimization measures described in Chapter 3, *Conservation Strategy*, to avoid or reduce adverse effects on covered species and natural communities.

As a joint habitat conservation plan (HCP) and natural community conservation plan (NCCP), the BDCP has been designed to meet the requirements of both state and federal endangered species laws and provide the basis for nonfederal entities to obtain take authorizations from the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) pursuant to Section

10 of the ESA and from the California Department of Fish and Game (DFG) under Section 2835 of the NCCPA, and potentially under Section 2081 of the California Endangered Species Act (CESA).[1]

Specifically, the Department of Water Resources (DWR) and certain SWP contractors are seeking regulatory coverage under the ESA and the NCCPA to ensure that certain of their activities within the geographic scope of the BDCP, including conveyance, diversions, exports, or use of water from the Delta associated with energy generation, comply with these laws. To meet these regulatory objectives, the BDCP sets out a comprehensive conservation strategy that addresses the effects of SWP, the Central Valley Project (CVP), and certain existing and future actions that may occur within the Plan Area on aquatic and terrestrial species, including those listed under the ESA or CESA as threatened, endangered, or candidates for listing, as well as on critical habitat, if any, that has been designated for these species (Chapter 3, *Conservation Strategy*).

The BDCP is not the sole vehicle for compliance with these regulations. Activities by Reclamation affecting federally proposed or listed threatened or endangered species, or their designated critical habitat, can only be authorized under ESA Section 7. Additionally, water management activities associated with Delta diversions by Reclamation, DWR, and certain SWP contractors are currently regulated under an existing Section 7 process and will continue to be regulated under that process until the new north Delta diversions become operational, approximately 10 years into the BDCP implementation process. Thereafter, DWR and SWP contractor activities related to diversions in the Delta, as well as to SWP and CVP operations that occur upstream of the Delta, will be regulated under the BDCP.

Reclamation's Section 7 compliance process The biological assessment (BA) for federal actions in the Delta will incorporate the BDCP conservation strategy as it relates to those actions in the Delta and will serve as a companion document to the BDCP. The BDCP does not attempt to distinguish precisely between the effects on covered species and their habitat attributable to the CVP-related federal actions and to covered activities associated with the SWP. Rather, the BDCP includes a comprehensive analysis of the effects related to both the SWP and the CVP within the Plan Area and sets out a conservation strategy that adequately addresses the totality of those effects. On the basis of the BDCP and the companion BA, it is expected that the USFWS and NMFS will issue Section 10 permits and a new joint biological opinion (BO) that will supersede BOs existing at that time as they relate to SWP and CVP actions addressed by the BDCP, as well as SWP and CVP operations affected by the BDCP that occur upstream of the Delta.

4.1.1 History and Overview of the SWP and CVP

This section provides an overview and a summary of the history of the SWP and the CVP. Additional detail is provided by DWR (2010).

4.1.1.1 SWP

The SWP is operated to provide water for agricultural, municipal, industrial, recreational, and environmental purposes, and to control flooding. As conditions of the water right permits and licenses, the California State Water Resources Control Board (State Water Board) requires that the SWP meet specific water quality, quantity, and operational criteria in the Delta. The development of the SWP was necessitated by the tremendous population growth that occurred in California after the

[1] The BDCP has also been developed to meet the permit issuance standards of CESA for the activities described in this chapter.

Second World War. The State of California recognized at the time that local water supplies alone would not be sufficient to meet future regional demands, prompting the legislature in 1945 to commission an investigation of statewide water needs. That investigation resulted in recommendations for substantial new water infrastructure, including the development of various aqueducts and channels, a multipurpose dam and reservoir near Oroville on the Feather River, and an aqueduct to carry water from the Delta to the San Joaquin Valley and southern California (California Department of Water Resources 2010).

In 1960, California voters authorized the first phase of the SWP, which enabled water deliveries from watersheds of northern California to the cities of southern California and to farmers in the Tulare Basin that were beyond the reach of the CVP. After the SWP was passed by voters in 1960, the California Aqueduct, the main conveyance for the SWP, Clifton Court Forebay, and Harvey O. Banks Pumping Plant west of Tracy were constructed (Figures 4-1 and 4-2 depict both CVP and SWP facilities).

Today, the SWP consists of 34 storage facilities (reservoirs and lakes), 20 pumping plants, 4 pumping-generating plants, 5 hydroelectric power plants, and about 701 miles of open canals and pipelines. It provides water that supplements local sources for approximately 20 million Californians and about 660,000 acres of irrigated farmland (California Department of Water Resources 2010).

The SWP distributes water to 29 urban and agricultural water suppliers in northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and southern California. These suppliers, known as the SWP contractors, receive specified annual amounts of water as provided by contracts with DWR.[2] These contracts are subject to renewal during the period 2035 through 2042. Of the total water supply under contract, 70% is allocated to urban users and 30% to agricultural users (California Department of Water Resources 2010).

4.1.1.2 CVP

Beginning in the late 1800s, the State of California recognized the potential to deliver surplus water from the Sacramento River to the dry, but potentially productive, San Joaquin Valley (Alexander et al. 1874). The State further recognized, as reflected in the 1930 State Water Plan (Department of Public Works 1930), that the development of upstream storage capacity along the Sacramento River could simultaneously resolve two major water problems facing the State: water shortages in the San Joaquin Valley, where pumping in excess of natural groundwater recharge was occurring; and salinity intrusion into the Delta, which could be addressed with a hydraulic salinity barrier created through controlled releases of water from upstream storage (Lund et al. 2007). This water plan served as a blueprint for the eventual CVP.

In 1933, the State legislature and the voters of California approved the CVP. Shortly thereafter, California ceded control of the project to the federal government to maximize federal financial contributions during the Great Depression. Construction of Shasta Dam, one of the primary components of the CVP, began in 1938. In the 1940s, federal agencies agreed on an approach to divert water from the Sacramento River, which relied on a small cross-channel to move water

[2] Under existing contract conditions, in 2010 DWR was obligated to make 4.167 million acre-feet /year of water available to its contractors, except under certain conditions specified in the contract, including shortage of supply availability, under which a lesser amount may be made available.

through the Delta. This channel, which was constructed by Reclamation in 1944, is known as the Delta Cross Channel.

Following the construction of the Friant Dam (1942) and the Friant-Kern Canal (1948), the CVP began diverting San Joaquin River water to supply irrigators on the east side of the San Joaquin Valley. Subsequent projects on the west side of the Sacramento Valley, notably the Tehama-Colusa Canal (1980), increased capacity for upstream diversions from the Sacramento River. The CVP's major water storage facilities are located at the Shasta, Trinity, Folsom, and New Melones Dams (Bureau of Reclamation 2008) (Figure 4-2). The primary water pumping facility for the CVP is the Jones Pumping Plant, which is located west of the City of Tracy.

The CVP presently consists of 20 dams and reservoirs, 11 power plants, and 500 miles of major canals, as well as conduits, tunnels, and related facilities. These facilities provide sufficient quantities of water to irrigate approximately one-third of the agricultural land of California and to provide for municipal and industrial use to support close to 1 million households for 1 year (Bureau of Reclamation 2011). Over 250 contractors in 29 out of 58 counties in California have entered into long-term contracts for CVP water (California Department of Water Resources 2008).

The Central Valley Project Improvement Act (CVPIA) of 1992 mandated that the CVP be partly managed for the protection, restoration, and enhancement of fish and wildlife. The CVPIA provided for annual allocations of water to support fish and wildlife resources, a habitat restoration fund financed by water and power users, and a moratorium on new water contracts until such time as fish and wildlife goals are achieved (Bureau of Reclamation 2010).

4.1.2 Overview of Covered Activities and Associated Federal Actions

The SWP and CVP function as two interbasin water storage and delivery systems that divert and redivert water from the southern portion of the Delta. The SWP and CVP use reservoirs upstream of the Delta to store water, and use both natural watercourses and canal systems to transport water to areas south and west of the Delta. The CVP also includes facilities and operations on the Stanislaus and San Joaquin rivers, such as the New Melones and Friant Dams.

The SWP and CVP are permitted by the State Water Board to store water during wet periods, divert water that is surplus to the Delta, and redivert water that has been stored in upstream reservoirs. Both SWP and CVP operate pursuant to water right permits and licenses issued by the State Water Board that allow for the appropriation of water by diverting to storage or by directly diverting to use and re-diverting releases from storage later in the year. As conditions of their water right permits and licenses, the State Water Board requires that the CVP and SWP meet specific water quality, quantity, and operational criteria within the Delta.[3] Reclamation and DWR closely coordinate their management of the operations of the SWP and CVP to meet these conditions.

All covered activities described in this chapter will be covered for the duration of the 50-year permits, with one exception. The BDCP does not seek coverage for current SWP and CVP operations, which will continue to be regulated under an existing Section 7 process. BDCP does seek coverage for those operations when and after the new north Delta intakes become operational, beginning in approximately the 10th year of BDCP implementation. Therefore, references to SWP and CVP

[3] DWR has a separate contract to provide water to the North Delta Water Agency (NDWA) and that contract has separate water quality standards.

operations in the following discussion apply only to those operations as they are to be performed after the north Delta intakes become operational.

The BDCP covered activities consist of activities in the Plan Area associated with the conveyance and export of water supplies from the SWP's Delta facilities and with the implementation of the BDCP conservation strategy. Each of these activities falls into one of four categories:

- New water facilities construction, operation, and maintenance.
- Operations and maintenance of SWP facilities.
- Nonproject diversions.
- Habitat restoration, enhancement, and management.

The BDCP-associated federal actions comprise those activities that are authorized, funded, or carried out by Reclamation within the Plan Area and relate to the operation of the CVP's Delta facilities to meet CVP purposes. These actions include the operation of existing CVP Delta facilities to convey and export water for project purposes, and associated maintenance and monitoring activities. The CVP is operated in coordination with the SWP under the Coordinated Operations Agreement (COA). While the SWP and CVP are separate systems, they function in an integrated and coordinated manner.

Certain other actions associated with the SWP and CVP are not within the scope of the BDCP. These actions occur upstream of the Delta, outside of the Plan Area, and include the operations of certain reservoirs and the diversion and delivery of certain water supplies. Although these other activities are not addressed by the BDCP, the effect of the BDCP on those activities and the effects of those activities on listed species will be analyzed and addressed in the joint BO to be issued pursuant to the BDCP or in subsequent biological opinions that cover project-related activities that are outside of the Plan Area.

4.1.3 New Water Facilities Construction, Operations, and Maintenance

*[**Note to Reviewers**: All covered activities have been rewritten and reorganized to be consistent with the detailed descriptions in the EIR/EIS. The conveyance facility is described here as a tunnel/pipeline; however, it has not been decided if the conveyance facility will be a tunnel/pipeline or a canal facility. Full design detail on these facilities is in development and will be provided by reference or in an appendix to the BDCP .]*

4.1.3.1 Tunnel/Pipeline Facility Construction and Operations

4.1.3.1.1 Background

DWR is planning to construct new diversion and conveyance facilities that will be designed and operated to improve protections for fish by bringing water from the Sacramento River in the north Delta to the existing water export pumping plants in the south Delta (Figures 4-3 and 4-4). This new tunnel/pipeline facility will allow for reductions in diversions from the existing SWP and CVP south Delta facilities, thereby reducing entrainment of covered fish species. For a more detailed description of the biological benefits of the tunnel/pipeline, see Chapter 3, *Conservation Strategy*.

The new facility will include five intake structures fitted with state-of-the-art positive barrier fish screens. Water will travel in pipelines from the intakes to a sedimentation basin and solids lagoon before reaching the intake pumping plants. From the intake pumping plants water will be pumped into another set of pipelines to an Intermediate Forebay (via a transition structure) or to a tunnel (Tunnel 1) that will also carry water to the Intermediate Forebay. From this forebay, water could be pumped or conveyed by a gravity bypass system into a dual-bore tunnel (Tunnel 2) that will run south to a new forebay near Byron Tract, adjacent to Clifton Court Forebay. This arrangement will enhance water supply operational flexibility, using forebay storage capacity to regulate flows from north Delta intakes and flows to south Delta pumping plants. Byron Tract Forebay will be designed to provide water to Jones Pumping Plant 24 hours per day while minimizing on-peak pumping at north Delta intakes and allowing pumping criteria to limit diversions to two 6-hour ebb tide periods. The tunnel/pipeline system will improve protections for water supplies from flood, earthquake, and sea level rise.

New connections will be constructed between the new Byron Tract Forebay and the Banks and Jones Pumping Plants, along with control structures to regulate the relative quantities of water flowing from the north Delta and the south Delta.

The system design will comprise the components listed below.

- Intakes
  - Five new on-bank water intake facilities on the east bank of the Sacramento River between Clarksburg and Walnut Grove. Each 3,000 cubic feet per second (cfs)-diversion-capacity facility will rise approximately 55 feet from river bottom to top of structure with a length of 900 to 1,600 feet, depending on location. All intakes will beequipped with vertical, structurally reinforced wedge wire screen panels of stainless steel with 1/16-inch openings (i.e., fish screens). These self-cleaning, positive barrier fish screens designed to be protective of salmonids and delta smelt. Fish screens will comply with DFG, NMFS, and USFWS fish screening criteria.
  - New intake facilities will necessitate the replacement of existing levees with new setback levees along with dredging and channel modification activities.
- Pumping plants
  - Intake pumping plants with a capacity of 3,000 cfs each to convey water from intake facilities into pipelines, eventually connecting to the rest of the conveyance structures. Each plant and its associated facilities will encompass approximately 20 acres adjacent to the intake facility.
  - An Intermediate Pumping Plant with a capacity of 15,000 cfs to convey the water collected from the intake facilities between intermediate conveyance structures such as tunnels, canals, and forebays.
  - Pumping plant facilities will include sedimentation basins, solids handling facilities, transition structures, surge shafts or towers, one or two substations, a transformer, a mechanical room, an access road, and other associated facilities and utilities.

- Pipelines
  - Intake pipelines to carry water between intakes and intake pumping plants. Each intake facility will convey water through six 12-foot-diameter pipelines to the adjacent pumping plant.
  - Conveyance pipelines to carry water between intake pumping plants and other conveyance facilities such as tunnels, canals, and forebays. Two or four 16-foot-diameter conduits will be used for conveyance pipelines.
- Tunnels
  - One single-bore 29-foot-diameter tunnel to convey water more than 27,000 feet from intake pumping plants to a new Intermediate Forebay approximately 4,500 feet south of the confluence of Snodgrass Slough and the Sacramento River.
  - One dual-bore 33-foot-diameter tunnel to convey water 176,000 feet from the new Intermediate Forebay to a new Byron Tract Forebay, adjacent to Clifton Court Forebay.
- Forebays
  - A 750-acre Intermediate Forebay near Courtland to store water between intake facilities and the tunnel conveyance segment about 4,500 feet south of the confluence of Snodgrass Slough and the Sacramento River.
  - A 630-acre Byron Tract Forebay directly southeast of Clifton Court Forebay to store water between new conveyance structures and existing SWP and CVP south Delta export facilities.
- Connections and control structures to the Banks and Jones Pumping Plants.
  - A 2,000-foot-long canal to carry water from the Byron Tract Forebay to existing approach canals to the Banks and Jones Pumping Plants.
  - A set of gates in the approach canal to the Banks Pumping Plant upstream of the connection to Byron Tract Forebay.
  - A set of gates at the outlet between the embankment of the Byron Tract Forebay and the approach canal to the Jones Pumping Plant.
  - A set of gates in the approach canal to the Jones Pumping Plant upstream of the connection to Byron Tract Forebay.
- A precast segment plant and yard to produce tunnel segments. The plant will include offices, materials storage, casting facilities, and a concrete batch plant. Other structures, such as a barge unloading facility, will also be necessary if barge transportation is chosen for conveyance of construction materials.
- Transmission lines running from the existing electrical grid to project substations.
- Borrows, spoils, and tunnel muck storage/disposal areas.

Other actions necessary to support the development and operation of a new tunnel/pipeline facility are covered under the BDCP. They include activities to improve local drainage systems affected by the new conveyance infrastructure, upgrade existing utilities and develop new utility infrastructure, establish temporary construction staging sites, install temporary and permanent roads, and dispose of spoils on certain sites. More detail on specific features of the tunnel/pipeline facility is provided in Appendix M, *Facilities Design Information*.

New intake and conveyance facilities specifications are summarized in Table 4-1.

Table 4-1. Summary of Pipeline/Tunnel Conveyance Physical Characteristics

Feature Description/Surface Acreage		Approximate Characteristics
Overall project/5,700		
	Conveyance capacity (cfs)	3,000–15,000
	Overall length (miles)	45
Intake facilities/1,600		
	Number of in-river screened intakes	5
	Flow capacity at each intake (cfs)	3,000
Intake pumping plants/(included with intake facilities)		
	6 Pumps per intake plus one spare, capacity per pump (cfs)	500
	Total dynamic head (feet)	30–57
	Total electric load (megawatts)	65
Tunnels/370 (permanent subsurface easement = 2,000 acres)		
Tunnel 1 connecting Intake 1 to Tunnel 2, maximum flow 3,000 cfs		
	Tunnel length (feet)	27,000
	Number of tunnel bores; number of shafts (total)	1; 2
	Tunnel finished inside diameter (feet)	29
Tunnel 2 connecting Intermediate Pumping Plant to Byron Tract Forebay, maximum flow 15,000 cfs		
	Tunnel length (feet)	176,000
	Number of tunnel bores; number of shafts (total)	2; 14
	Tunnel finished inside diameter (feet)	33
Intermediate Forebay/1,200		
	Water surface area (acres)	750
	Active storage volume (acre-feet)	5,250
Intermediate pumping plant (in Reach 2, at southern end of Intermediate Forebay)		
	Number of pumps, capacity per pump (cfs)	10 at 1,500 (high head) 6 at 1,500 (low head)
	Total dynamic head (feet)	0–90
	Total electric load (megawatts)	136
Byron Tract Forebay / 900		
	Water surface area (acres)	630
	Active storage volume (acre-feet)	4,300
Power requirements		
	Total conveyance electric load (megawatts)	210
cfs = cubic feet per second		

Chapter 3, *Conservation Strategy*, includes a description of the long-term operations criteria and adaptive ranges for SWP and CVP with dual operations, including the new intakes and tunnel/pipeline facilities. These measures have been designed to minimize the potential effects of

water conveyance and diversion actions associated with the new intakes and tunnel/pipeline facilities on covered fish species and their habitat.

4.1.3.1.2 Conveyance Facilities Maintenance Activities

Intakes and Screens

The proposed intake facilities will require routine or periodic adjustment and tuning to ensure that operations are managed in accordance with design intentions. Facility maintenance includes activities such as painting, cleaning, repairs, and other routine tasks to ensure that the facilities are operated in accordance with design standards after construction and commissioning. Activities will involve performing routine, preventive, predictive, scheduled, and unscheduled maintenance aimed at preventing failure or deterioration of equipment and facilities.

The only systems associated with the intakes involving power-driven and routinely moving parts are the screen cleaning systems and gantry crane hoist systems. Lubrication of bearings, continuity checks of limit/torque switches, and periodic inspections of equipment in accordance with manufacturer recommendations will be the primary operations and maintenance tasks anticipated for these systems. Strip brushes for the screen cleaning systems will need replacement every several years.

Intake facilities will be designed such that all mechanical elements can be removable from the top surface for convenience of inspection, cleaning, and repairs as needed. The intakes will feature top-side gantry crane systems for removal and insertion of screen panels, louver assemblies, and bulkheads. It is expected that all panels will require annual removal (at a minimum) for pressure washing. Additionally, individual intake bays will require dewatering (one pair at a time) for inspection and assessment of biofoul growth rates. Dewatering is accomplished by closing off portals with prefabricated bulkheads. Metalwork in intakes is expected to consist of plastics and austenitic steels (stainless); therefore, corrosion is not expected to be detrimental to the life of the facilities. Maintenance associated with these systems consists of replacing sacrificial (zinc) anodes at multiyear intervals.

Continuous general inspections will be important for monitoring and logging performance, recording the history of facility conditions and deterioration, and preventing mechanical and structural failures of project elements. Sediment removal will be carried out through suction dredging, mechanical excavation, and dewatering to remove sediment buildup. If large debris is found to have accumulated around intakes, removal will require underwater diving crews, boom trucks or rubber wheel cranes, and possibly a small barge and crew to rig the leads to the debris. While the screens will require cleaning at a frequency commensurate with debris load conditions in the river, the continuous traveling brush mechanisms or other screen cleaning technologies are expected to maintain a relatively clean screen face and adequate open area. Nevertheless, biofouling can occlude the screens and jeopardize function over time.

Damage incurred by the intake facilities (e.g., boat collisions, debris impact, stone and sediment abrasion) may require repairs.

Maintenance will be needed for the intake pumping plants, sedimentation basins, and solids lagoons. This includes service based on a schedule recommended by the manufacturers, mussel and solids removal, and checking and replacing worn parts. Major equipment repairs and overhauls will be

conducted at a centralized maintenance shop. Routine site maintenance will include landscape maintenance, trash collection, and outdoor lighting repair or replacement.

Pipeline/Tunnel

Some of the critical considerations in terms of tunnel/pipeline maintenance will include evaluating whether the tunnel/pipeline needs to be taken out of service for inspection and, if so, how frequently this will be required. Typically, new water conveyance pipelines are inspected at least every 10 years for the first 50 years and more frequently thereafter. Dewatering of the tunnel/pipeline facility for maintenance purposes is expected to be conducted but it is assumed that only one of the tunnel/pipelines at a time will be dewatered, allowing continued north Delta diversions to the Intermediate Forebay. Depending on the monthly demands, diversion needs could be met or may be temporarily reduced. The entire dewatering and nonroutine maintenance process will likely be completed in a month and could be timed for low diversion periods. Dewatering for maintenance will be conducted approximately once every 5, 10, or 20 years. This type of irregular maintenance will require an additional set of pumps, temporarily located at either the Byron Tract Forebay or at one of the shafts along the tunnel/pipeline route. While these pumps will have some noise associated with them, their operation will last less than a month per use and will occur at 5-, 10-, or 20-year intervals. A crane at the shaft site will launch and retrieve remotely operated vehicles for inspection of the interior of the tunnel/pipeline; a portable generator to supply power may also be necessary at the site. All work will be within the right-of-way at the shaft.

Forebays

Forebay maintenance considerations include regular harvesting of pond weed to maintain flow and forebay capacity, the installation of automatic trash raking equipment and disposal facilities, and potential sediment dredging approximately every 50 years. Maintenance requirements for the forebay embankments include control of vegetation and rodents, embankment repairs in the event of island flooding and wind wave action, and monitoring of seepage flows. Maintenance requirements for the spillway include the removal and disposal of any debris blocking the outlet culverts. Debris in the stilling basin will require removal to ensure normal water flow through outlet culverts.

Other Maintenance Activities

Additional activities that could be necessary are listed below. This is not necessarily an exhaustive list.

- Maintenance of powerlines (insulator washing and routine tower/pole maintenance and replacement) and interconnection substations.
- Permanent roads and fencing.
- Pipelines that could require excavation.
- Backup power supplies (e.g., testing).
- General buildings and facilities.
- Any permanent marine facilities such as barge uploading facilities that provide access to tunnel/pipeline shaft locations (may require localized dredging and other maintenance work, such as painting, decking replacement/repair, and removing barnacles).

In summary, all construction, operations and maintenance of the new intakes, screens, pumps, and conveyance facilities described in this section are covered activities and the effects of those activities are addressed by the BDCP (Chapter 3, *Conservation Strategy* and Chapter 5, *Effects Analysis*). DWR is seeking ESA Section 10 and NCCPA Section 2835 permits for all maintenance of these new facilities not otherwise restricted by the BDCP conservation strategy.

4.1.3.2 Fremont Weir and Yolo Bypass Improvements and Maintenance

4.1.3.2.1 Background

The purpose of this activity is to modify the Fremont Weir and Yolo Bypass and operate the Fremont Weir to increase the availability of floodplain habitat for spawning and rearing for covered fish species, enhance food production within and downstream of the Yolo Bypass, and improve fish passage within and nearby the Yolo Bypass (for details, see Conservation Measure [CM] 2 Yolo Bypass Fish Habitat Improvements in Chapter 3, *Conservation Strategy*). Specifically, the Fremont Weir and Yolo Bypass modifications and operations will accomplish the following benefits.

- Improve rearing and spawning habitat for covered fish species.
- Provide for a higher frequency and duration of inundation of the targeted portion of the Yolo Bypass.
- Improve fish passage in the Yolo Bypass, Putah Creek, and past the Fremont and Sacramento weirs.

Ten physical modifications to the Fremont Weir, Yolo Bypass and the Sacramento Weir and their resulting effects are proposed as covered activities and are listed below (additional details are presented in Chapter 3, *Conservation Strategy*). While not all of these actions will occur, some combination of the actions will be implemented, so all are proposed as covered activities.

- **Replace the Fremont Weir fish ladder.** The covered activities include removing and replacing the existing Fremont Weir Denil fish ladder with new experimental fish passage facilities designed to allow for the effective passage of all covered fish species including adult sturgeon and salmonids.
- **Install experimental sturgeon ramps.** The covered activities include constructing experimental ramps at the Fremont Weir to allow for the effective passage of adult sturgeon and lamprey.
- **Construct deep fish passage gates and channel.** The covered activities include removing a section of the Fremont Weir, soil excavation, fitting the remaining notch with operable fish passage gates that allow controlled flow into the Yolo Bypass, and excavation of a deeper fish passage channel to convey water from the Sacramento River to the new fish passage gates, and from the fish passage gates to the Tule Canal to convey water from the Sacramento River, through the gates, and to the Tule Canal.
- **Modify the existing Fremont Weir stilling basin.** The covered activities include modifications to the existing Fremont Weir stilling basin to ensure that the basin drains sufficiently into the deep fish passage channel.
- **Improve the Sacramento Weir.** The covered activities include excavation of a channel to convey water from the Sacramento River to the Sacramento Weir and from the Sacramento Weir

to the Tule Canal/Toe Drain, construction of new gates at a portion of the weir, and minor modifications to the stilling basin of the weir to ensure proper basin drainage.

- **Improve the Tule Canal/Toe Drain and Lisbon Weir.** The covered activities include physical modifications to passage impediments in the Tule Canal and Toe Drain (e.g., road crossings and agricultural impoundments) and redesigning Lisbon Weir to improve fish passage while maintaining or improving water capture efficiency for irrigation.
- **Realign Lower Putah Creek.** The covered activities include realigning Lower Putah Creek to improve upstream and downstream passage of Chinook salmon and steelhead in Putah Creek, and restoring floodplain habitat to provide benefits of seasonal floodplain habitat.
- **Create a notch in the Fremont Weir and a connecting channel.** The covered activities include the addition of new operable gates on the weir that allow for the control of the timing, duration, magnitude and frequency of inundation of the Yolo Bypass during non-flood stage periods of the Sacramento River.
- **Modify the Yolo Bypass.** The covered activities include grading, removal of existing berms, levees, and water control structures, construction of berms or levees, re-working of agricultural delivery channels, and earthwork or construction of structures to reduce Tule Canal/Toe Drain channel capacities.
- **Create a gated westside channel.** The covered activities include creation of a gated channel to provide flows into Yolo Bypass along the west side, and potential modification of the existing configuration of the discontinuous channels along the western edge of the Yolo Bypass to reduce diversion of Delta water for Yolo Bypass irrigation while maintaining or improving fish passage for all covered fish species.

Maintenance of Fremont Weir and Yolo Bypass Improvements

Routine maintenance of the Fremont Weir and Yolo Bypass are covered activities. Vegetation maintenance activities may include mowing, discing, livestock grazing, dozing, spraying, and/or hand-cutting of young willow groves, cottonwoods, arundo, brush, debris, and young selected oak trees. Trees with a trunk diameter of 4 inches or greater may be pruned up 6 feet from the ground. Clearing of areas will be done in stripes to open areas for water flow and to avoid islands and established growth. On a nonroutine but periodic basis, sediment will be removed from the Fremont Weir area using graders, bulldozers, excavators, dump trucks, or other machinery. Outside of the new channel, sediment removal of approximately 1 million cubic yards within 1 mile of the weir can be reasonably expected to occur on an average of approximately every 5 years based on recent maintenance history. Primarily inside the new channel, an additional 1 million cubic yards every other year of sediment removal is anticipated as a conservative estimate of sediment management. Where feasible, work will be conducted under dry conditions; if necessary some dredging may be required to maintain connection along the deepest part of the channel for fish passage. Where agreements can be made with landowners, sediment may be disposed of on properties in the immediate vicinity of the Fremont Weir area. It may also be used as source material for levee or restoration projects, or otherwise beneficially reused.

Maintenance activities will extend from the Sacramento River to the Fremont Weir, the Fremont Weir to the southern end of the Yolo Bypass, and between the associated levees.

In summary, all activities related to the construction, maintenance, replacement, and operations of the facilities described in this section, as well as access road improvements, are covered by the

BDCP. The construction of facilities necessary to provide electrical power to these facilities will also be covered by the BDCP. The operations of the new Fremont Weir gates under the near- and long-term criteria and adaptive range as described in Chapter 3, *Conservation Strategy*, are also covered by the BDCP.

4.1.3.3 North Bay Aqueduct Alternative Intake Project

4.1.3.3.1 Background

The BDCP will cover operation of the North Bay Aqueduct Alternative Intake Project. The project includes an additional intake on the Sacramento River that will operate in conjunction with the existing North Bay Aqueduct intake at Barker Slough (described in Section 4.2.2, *Operations and Maintenance of Existing SWP Facilities*). The project will be used to accommodate projected future peak demand of up to 240 cfs. The construction of any new facilities (any intakes, pipelines, and supporting facilities) associated with the North Bay Aqueduct Alternative Intake Project is not covered under the BDCP. Consequently, any such state and/or federal regulatory compliance requirements that will be applicable to the development of the project will be addressed through processes separate and apart from the BDCP.

Combined operations of a new intake on the Sacramento River and the existing intake at Barker Slough will be included under BDCP covered activities for future peak demand of up to 240 cfs. Operations of the North Bay Aqueduct Sacramento River intake will conform, in combination with the new BDCP intake facilities on the Sacramento River, to the water operations criteria and adaptive range as described in Chapter 3, *Conservation Strategy.* The North Bay Aqueduct Alternative Intake Project may also consider an alternative that will involve the export of water from the Sacramento River through the proposed BDCP north Delta facilities.

4.1.4 Operations and Maintenance of SWP Facilities

This section describes covered activities that will be carried out by DWR to operate and maintain SWP facilities in the Delta after the north Delta intakes become operational. These activities involve the daily operation of water diversion, conveyance, and delivery systems and appurtenant facilities within the Plan Area. The flow diversions associated with these operations will be constrained as described under CM 1 Water Facilities and Operations.

SWP facilities within the Plan Area consist of the Clifton Court Forebay; Banks Pumping Plant; Skinner Fish Facility; installation, operation, and removal of temporary barriers in the south Delta; the northern portion of the California Aqueduct; Barker Slough Pumping Plant; and eastern portions of the North Bay Aqueduct (Figures 4-1 and 4-2). Additional facilities that will be built during construction of the new north Delta intakes include the intakes, sedimentation basins and solids handling facilities, intake pumping plants, new setback levees, pipelines and a tunnel to convey water from the intake pumping plants to the new Intermediate Forebay, the Intermediate Forebay, and the tunnel to convey water under the Delta to Byron Tract Forebay. These SWP facilities will be used to export water from the south Delta (Banks Pumping Plant) and from the north Delta (Barker Slough Pumping Plant) into canals and pipelines that carry it to municipal and industrial and agricultural water contractors in the San Francisco Bay Area and southern California. These facilities are integral components of the SWP and contribute to the functional capacity of the overall system. This section describes these facilities, their operational requirements, and the actions necessary to maintain their viability. The manner in which these facilities are operated and maintained is not

only integral to the proper functioning of the water supply system, but integrated with the actions in the BDCP conservation strategy to provide for the conservation of the aquatic ecosystem and covered fish species.

The following descriptions of SWP-related covered activities are intended to be sufficiently broad to cover all aspects of the operation and maintenance of identified SWP facilities that may potentially affect resources covered by this Plan, including covered species and their habitats. The measures to address the effects of these covered activities on covered resources are set out in the BDCP conservation strategy (Chapter 3, *Conservation Strategy*).

4.1.4.1 Clifton Court Forebay

Water for the SWP is diverted into Clifton Court Forebay and pumped at Harvey O. Banks (Banks) Pumping Plant. Clifton Court Forebay is a 31,000-acre-foot regulatory reservoir located in the southwestern edge of the Delta, about 10 miles northwest of the City of Tracy. Inflows to Clifton Court Forebay from surrounding channels are controlled by radial gates, which are generally operated based on the tidal cycle to reduce approach velocities, prevent scour in adjacent channels, and minimize water level fluctuation in the south Delta by taking water in through the gates at times other than low tide. When a large head differential (difference in water surface elevation) exists between the outside and the inside of the gates, theoretical inflow can be as high as 15,000 cfs for a short time, though actual inflow will be constrained in accordance with the BDCP conservation strategy.

Withdrawals to Clifton Court Forebay will be performed in accordance with CM 1 Water Facilities and Operations. DWR is seeking ESA Section 10 and NCCPA Section 2835 permits for operations and maintenance of Clifton Court Forebay from the time the proposed north Delta intakes become operational.

4.1.4.2 Harvey O. Banks Pumping Plant

The Harvey O. Banks Pumping Plant is in the south Delta, about 8 miles northwest of Tracy and marks the beginning of the California Aqueduct. By means of 11 pumps, including two rated at 375-cfs capacity, five at 1,130-cfs capacity, and four at 1,067-cfs capacity, the Banks Pumping Plant provides the initial lift of water 244 feet into the aqueduct. The nominal capacity of the Banks Pumping Plant is 10,300 cfs. The pumps can be operated at full capacity to enable diversions to utilize power in off-peak periods.

CM 1 Water Facilities and Operations, includes a description of the operations criteria and adaptive limits for south Delta operations of the SWP and CVP. These measures have been designed to address the effect on covered fish species of water conveyance and diversion actions associated with the Banks Pumping Plant. Refer to Section 4.2.2.10 below for a description of the types of maintenance activities that may occur. DWR is seeking ESA Section 10 and NCCPA Section 2835 permits for all operations and maintenance of Banks Pumping Plant from the time the proposed north Delta intakes become operational.

4.1.4.3 John E. Skinner Delta Fish Protective Facility

The John E. Skinner Delta Fish Protective Facility (Skinner Fish Facility) is located at the head of the Intake Channel that connects Clifton Court Forebay to the Banks Pumping Plant. The Skinner Fish Facility screens fish away from the pumps. Debris is directed away from the pumps by a 388-foot-

long trash boom. Fish are diverted from the intake channel into bypasses by a series of metal louvers, while the main flow of water continues through the louvers and toward the pumps. These fish pass through a secondary system of screens and pipes into seven holding tanks, where they are later counted and recorded. The salvaged fish are then returned to the Delta in oxygenated tank trucks.

DWR is seeking ESA Section 10 and NCCPA Section 2835 permits for all operations and maintenance of the Skinner Fish Facility from the time the proposed north Delta intakes become operational. Refer to the background description above with respect to operations of this facility, and to Section 4.2.2.10 for a description of the types of maintenance activities that may occur.

4.1.4.4 Barker Slough Pumping Plant and North Bay Aqueduct

The Barker Slough Pumping Plant diverts water from Barker Slough into the North Bay Aqueduct for delivery in Napa and Solano counties. The North Bay Aqueduct intake is located approximately 10 miles from the mainstem Sacramento River at the end of Barker Slough. The maximum pumping capacity is 175 cfs (pipeline capacity). During the last few years, daily pumping rates have ranged between 0 and 140 cfs. Each of the 10 North Bay Aqueduct pump bays is individually fitted with a positive barrier fish screen consisting of a series of flat, stainless steel, wedge-wire panels with a slot width of 3/32 inch. This configuration is designed to exclude fish 25 millimeters (mm) or larger from being entrained. The bays tied to the two smaller units have an approach velocity of about 0.2 foot per second (ft/sec). The larger units were designed for a 0.5-ft/sec approach velocity, but actual approach velocity is about 0.44 ft/sec. The screens are routinely cleaned to prevent excessive head loss, thereby minimizing increased localized approach velocities.

DWR is seeking ESA Section 10 and NCCPA Section 2835 permits for all operations and maintenance of the Barker Slough Pumping Plant from the time the proposed north Delta intakes become operational. Operations will include authorization for a future peak withdrawal of up to 240 cfs at the Barker Slough Pumping Plant.

4.1.4.5 New North Delta Intakes

Five new intakes will be constructed on the east bank of the Sacramento River between Clarksburg and Walnut Grove. The locations were selected to minimize the influence of tidal action, minimize the presence of delta smelt, maintain a separation distance between intakes, and minimize effects on existing communities. Each intake will divert a maximum of 3,000 cfs from the Sacramento River.

Each intake site will comprise a concrete structure, fish screens, a sedimentation basin, a solids lagoon, a pumping plant, conveyance pipelines to a point of discharge into the conveyance facility (pipelines/tunnels), a 69-kilovolt (kV) substation, new access roads and realignment of existing roadways, employee parking, lighting, fencing, and landscaping. A new setback levee (ring levee) will be constructed, and the space enclosed by the existing levee and new setback levee will be backfilled up to the elevation of the top of the setback levee, creating a building pad for the intake structure and adjacent pumping plant.

4.1.4.6 Intake Pumping Plant

Each pumping plant will include a cast-in-place- (CIP-) reinforced concrete structure and superstructure, a 230- kV power substation and transformer to supply power, an access road, flood protection embankments, parking, outdoor lighting, security fencing, and communication

equipment. In addition, intake pumping plants will have concrete sedimentation basins and associated solids handling facilities, and conveyance piping to a point of discharge into the proposed conveyance structure (i.e., pipelines/tunnels or canals). These structures and facilities will be located on the landside of the levee. To protect the structures from flood waters, the sedimentation basins, solids lagoons, and pumping plant will be constructed on engineered fill above design flood condition.

Each of the pumping plant sites will be approximately 1,000 by 1,000 feet (approximately 20 acres). The pumping plant will be approximately 262 feet long by 98 feet wide. Intake pumping plants will be constructed of reinforced concrete and have multiple floors to house mechanical and electrical equipment. The primary structural support systems used for the pumping plants will consist of reinforced concrete slabs and walls at and below grade, with steel framing and exterior metal wall and roof panels for the above-grade building. The pumping plant mechanical building system design criteria will conform to the requirements of Title 24, the California Mechanical Code, and other applicable codes, and will include heating, ventilation, air conditioning, plumbing, and fire protection systems.

4.1.4.7 Intermediate Forebay

The Intermediate Forebay will provide storage of approximately 5,250 acre-feet (af) with a surface area of 750 acres and will provide a transition between the north Delta intakes and the Intermediate Pumping Plant. The forebay will allow the Intermediate Pumping Plant to operate efficiently over a wide range of flows and hydraulic heads in the pipelines/tunnels. Limitations on delivery of water from the intakes into the Intermediate Forebay and the need to operate the Intermediate Pumping Plant efficiently will limit the ability to deliver flow from the pipelines/tunnels during portions of the day to the existing Banks and Jones Pumping Plants. For the Banks Pumping Plant, this includes operating at low flows during hours with high electrical costs and at maximum capacity during off-peak periods to minimize electrical power costs. The Jones Pumping Plant must operate continuously (24 hours per day, 7 days per week). The Byron Tract Forebay (see description below) will alleviate some of the impacts of these operational constraints and provide storage to balance inflow with outflow.

4.1.4.8 Intermediate Pumping Plant

The Intermediate Pumping Plant will include ten 1,500 cfs pumps to be used in higher hydraulic head condition, and six 1,500 cfs pumps for lower hydraulic head conditions. The pumping plant will include an approach channel from the forebay to the pump bays, the pumping plant structure, discharge pipes with flow measurement, transition manifold, and transition pipelines for discharge to the tunnel.

4.1.4.9 Tunnel

The tunnel conveyance will consist of a single bore 29-foot-inside-diameter tunnel on the northern end of the project and a two-bore, 33-foot-inside-diameter tunnel on the longer, southern end of the project. An Intermediate Forebay will be constructed to provide a hydraulic break before the diverted water enters the common tunnel conveyance system downstream. This hydraulic break will provide water conveyance operational flexibility and allow independent operation of each intake facility.

The tunnel system will be operated under pressurized conditions as a constant volume with isolation facilities to allow reducing the number of tunnels in operation during periods of lower flow and maintain velocity in active tunnels.

The tunnel invert elevation is assumed to be at 100 feet below mean sea level (msl), primarily to avoid peat deposits. It will be lowered to 160 feet below msl under the San Joaquin River and Stockton Deep Water Ship Channel to maintain sufficient cover between the tunnel and dredging operations in the shipping channel. A minimum horizontal separation of two outside tunnel diameters will be maintained in reaches with two tunnel bores.

4.1.4.10 SWP Diversions

The amount of water delivered by the SWP in any year has been and will continue to be variable. In any given year, it is to the amount of water that is hydrologically available and that can be diverted under contractual rights consistent with the terms and conditions of the BDCP and other applicable permits and regulations. SWP *project water* is water made available for delivery to the contractors by the project conservation and transportation facilities included in the system. In 2010, DWR was obligated to make 4.167 million af/year of water available to its contractors, except under certain conditions specified in the contract, including shortage of supply availability, under which a lesser amount may be made available. The obligation incrementally increases to a maximum amount of 4.173 million af/year in 2021. This quantity may be exceeded if DWR determines surplus water is available above and beyond that needed to satisfy all regulations, permits, and operational requirements.

The California Water Code requires the state to allow the use of SWP facilities to convey non-project water as long as the conveyance will not interfere with SWP operations. During drier years, conveyance capacity is available in SWP facilities for the transfer of water by other entities. Nonproject water for drought water banks, dry water purchase programs, and individual transfers has been conveyed through SWP facilities in the past and is expected to continue into the future. SWP facilities are also used to support groundwater banking programs, such as the Semitropic Water Banking and Exchange Program.

CM 1 Water Facilities and Operations, includes a description of the operations criteria and adaptive limits for the SWP and CVP under the BDCP. This measure has been designed to address the effect on covered fish species of water conveyance and diversion actions associated with the SWP and CVP. As such, the BDCP provides the basis for federal and state regulatory authorizations under the ESA and NCCPA for coverage of all diversion activities of the SWP in the Plan Area from the time the proposed north Delta intakes become operational.

4.1.4.11 Temporary Barriers in the South Delta

The South Delta Temporary Barriers Project consists of four barriers across south Delta channels for the purpose of benefitting southern Delta agricultural diverters by increasing water levels, improving circulation, and improving water quality, and for the purpose of benefiting San Joaquin River fall-run Chinook salmon by keeping them away from the export facilities. The existing South Delta Temporary Barriers Project consists of the annual installation and removal of temporary barriers at the following locations.

- Middle River near Victoria Canal, about 0.5 mile south of the confluence of Middle River, Trapper Slough, and North Canal.

- Old River near Tracy, about 0.5 mile east of the Delta-Mendota Canal intake.
- Grant Line Canal near Tracy Boulevard Bridge, about 400 feet east of the Tracy Boulevard Bridge.
- Head of Old River (in Old River near its divergence from the San Joaquin River).

The barriers on Middle River, Old River near Tracy, and Grant Line Canal are tidal control facilities composed of rock and gated culverts designed to improve water levels and circulation for agricultural diversions and are in place during the growing season.

A physical barrier, the Head of Old River Barrier (HORB) will also be installed to benefit San Joaquin River salmonids and their habitat. It can be installed in the spring and the fall. In the past, a temporary barrier was periodically installed at this location at the direction of DFG.[4]

CM 1 Water Facilities and Operations, provides for installation and operation of temporary barriers in the South Delta. The Middle River, Old River, and Grant Line Canal barriers will likely continue to be utilized in the near-term in conjunction with the BDCP near-term conservation measures. The four barriers are generally installed beginning in early April. These barriers are partially operated through the end of May while delta smelt are in south Delta channels. During June, once the risk to delta smelt has passed, those barriers are allowed to begin full operations and continue full operations through the remaining summer and fall. Removal of the barriers begins in early November. The barriers are completely removed by November 30.

The HORB will be designed to discourage salmonids migrating downstream in the San Joaquin River from entering Old River and being exposed to the effects of the export pumps. The barrier will be operated in conjunction with Old and Middle San Joaquin River (OMR) flow criteria enabled by dual conveyance. Draft criteria have been developed to align use of the HORB with the D-1641 fall pulse flow intended to cue immigrating adult Chinook salmon into the San Joaquin River system. The proposal is to fully close the HORB and suspend south Delta diversion operations during the D-1641 flow pulse in October, and then operate it at 50% open for 2 weeks following the pulse flow. After that (beginning sometime in November), the HORB will be fully open during winter when San Joaquin River juvenile salmonids are moving out of the system (based on real time monitoring). Also, the HORB will be fully open whenever San Joaquin River flows are greater than 10,000 cfs at Vernalis.

During the spring months (April, May, and June), HORB operation will be conditioned upon flows of the San Joaquin River at Vernalis. These corresponding minimum OMR flow targets are focused on improving OMR flows in the Delta and flows in the San Joaquin River below HOR to improve survival and homing of salmonids. The proposed flows are intended to facilitate out-migration of San Joaquin River salmonids once they pass the Old River junction. These flows will also protect out-migrating steelhead from the Calaveras and Mokelumne basins. For the months of April and May, when Vernalis flows are below 5,000 cfs, an average net OMR target of -2,000 cfs or the USFWS reasonable prudent alternative (RPA) (whichever provides higher OMR flows) is proposed for evaluation via the research, monitoring and adaptive management program. Based on a review of particle tracking modeling and coded-wire tag studies, operations consistent with a -2,000 cfs OMR target produce hydrodynamic conditions on the San Joaquin River that should benefit salmon and smelt compared

[4] DFG has been responsible for directing DWR to install the fall barrier. Both DWR and DFG monitor the dissolved oxygen levels in the Stockton Deep Water Ship Channel. If dissolved oxygen is at a level that inhibits or prevents salmon from migrating up the San Joaquin River, then DFG directs DWR to install the barrier. This is a covered activity under BDCP and, therefore, can continue on into the future.

to existing conditions. When Vernalis flows are above 6,000 cfs, positive average net OMR flows are proposed for evaluation. It is believed such flow conditions will further improve salmonid outmigration and reduce predation without significant water supply reductions. A review of various CALSIM II modeling output from the January 2010 Project Operations suggested that during wetter years, little or no south Delta pumping will occur. Long-term use of all barriers will be evaluated under the BDCP adaptive management program.

Table 4-2 shows the initial operations of the barrier for the purposes of evaluating modifications to the initial project operations.

Table 4-2. Head of Old River Barrier Operations

Month	HORB[a]
October	50%
November	In/Out[b]
December	Out
January	50%[c]
February	50%
March	50%
April	50%
May	50%
June 1–15	50%
June 16–30	Out
July	Out
August	Out
September	Out

Notes
[a] Percent of time the HORB is open. Agricultural barriers are in and operated consistent with current practices.
[b] The HORB will be open 100% whenever flows are greater than 10,000 cfs at Vernalis. HORB is 100% closed during the D1641 San Joaquin River fall attraction pulse and open 50% for 2 weeks following D1641 San Joaquin River fall attraction pulse, and then the HORB will be open 100% through December.
[c] The HORB becomes operational at 50% when salmon fry are in the system (based on real time monitoring). This generally occurs when flood flow releases are being made.
HORB = Head of Old River Barrier; cfs = cubic feet per second;

4.1.4.12 Maintenance and Monitoring Activities

From the time the proposed north Delta intakes become operational, maintenance activities are covered activities under the BDCP. Maintenance activities include actions necessary to maintain the capacity and operational features of the existing water diversion and conveyance facilities, as described in this chapter, including Banks Pumping Plant, Clifton Court Forebay, the Temporary Barriers Project, Barker Slough Pumping Plant, North Bay Aqueduct, the Skinner Fish Facility, and the new north Delta facilities described previously. Maintenance activities also include canal maintenance, placement of riprap for bankline protection and erosion control, vegetation management and weed control, and operation and maintenance of electrical power supply facilities.

Maintenance activities also include repair and replacement as needed to ensure continued operations of facility or system components.

Monitoring activities for the operation of the SWP are BDCP covered activities. This includes water quality and other SWP monitoring activities. For BDCP fish and other biological monitoring activities, see Chapter 3, Section 3.5, *Adaptive Management and Monitoring Program*. DWR's Division of Operations and Maintenance conducts monitoring of chemical, physical and biological parameters to evaluate conditions of concern for drinking water, recreation, and fish and wildlife. Fish monitoring may also be conducted by DWR for the Temporary Barriers Project.

All SWP maintenance and monitoring described in this section that could affect species or modify critical habitat protected under ESA or CESA are covered activities from the time the proposed north Delta intakes become operational (see Chapter 3, *Conservation Strategy*).

4.1.5 Nonproject Diversions

*[**Note to Reviewers:** Decommissioning or screening of existing nonproject diversions is not currently described as a conservation measure in Chapter 3, Conservation Strategy. However, it would appropriately be described as such. If so, certain technical edits to this text will be needed.]*

4.1.5.1.1 Background

The area surrounding the Cache Slough and including Barker Slough, Ulatis Channel, Lindsey Slough, Hass Slough, Shag Slough, the Sacramento Deepwater Channel, Miner Slough, and Cache Slough comprises approximately 29,000 acres (Figure 4-5). These diversions primarily supply private agricultural activities; however, the Solano County Water Agency (SCWA) obtains more than half of its urban water supply from the North Bay Aqueduct intake on Barker Slough. This intake is part of the SWP, it is currently screened, and it is discussed in Section 4.2.1.3. There are 55 existing intake pipes using 46 existing diversions[5] located along these sloughs and waterways (excluding the North Bay Aqueduct intake). Most of the diversions are currently active. Table 4-3 identifies the number of intakes located in the area and their current operational status.

Table 4-3. Summary of Intakes in Cache Slough Area

Slough/Waterway	No. of Intakes	No. of Active Intakes	No. of Inactive Intakes
Lindsey Slough	5	5	0
Hass Slough	9	9	0
Barker Slough	1	1	0
Shag Slough	4	3	1
Miner Slough	14	12	2
Cache Slough	20	19	1
Ulatis Channel	1	1	0
Sacramento Deep Water Channel	1	1	0
Totals	**55**	**51**	**4**
Source: Solano County Water Agency 2011			

[5] In some cases multiple intake pipes use a single diversion.

Approximately half of the intakes are gravity fed and the remainder are either dual power (gravity and pumped) or are pumped (power from the existing electrical grid). The intakes have pipes sized less than 15 inches in diameter (23 intakes), over 15 but less than 30 inches in diameter (22 intakes), or 30 inches in diameter (12 intakes) (Solano County Water Agency 2011).

The diversions have a wide range of capacity, summarized in Table 4-4. Over two-thirds of the intakes have a maximum capacity between 1 and 50 cfs, while approximately nine of the intakes have a maximum capacity of greater than 50 cfs. The largest two diversions are the area 66-inch gate located on Lindsey Slough (maximum capacity of 200 cfs) and the RD2068 pumping plant (maximum pumping capacity of 325 cfs). Table 4-4 summarizes the intake capacity of the diversions.

Table 4-4. Summary of Intake Capacity (cubic feet per second)

Slough/Waterway	No. of Intakes	No. of Intakes 0 to 10 cfs	No. of Intakes 10 to 50 cfs	No. of Intakes 50 to 100 cfs	No. of diversions over 100 cfs
Lindsey Slough	5	3	1	0	1
Hass Slough	9	2	6	0	1
Barker Slough	1	0	1	0	0
Shag Slough	4	0	2	2	0
Miner Slough	14	12	2	0	0
Cache Slough	20	6	9	5	0
Ulatis Channel	1	0	1	0	0
Sacramento Deep water Channel	1	0	1	0	0
Totals	**55**	**23**	**23**	**7**	**2**
Source: Solano County Water Agency 2011					

The maximum diversion capacity of all the intakes in this area is approximately 1,500 cfs (excluding the North Bay Aqueduct) (Solano County Water Agency 2011). This capacity fluctuates throughout the year depending on the season and amount of water needed to satisfy differing demands.

Diversions to satisfy agricultural demand generally occur during the agricultural irrigation period, between April and August, depending on the crop. The agricultural diversions use an average of approximately 25%, or approximately 412 cfs, of the maximum diversion capacity over the course of the irrigation season (Rabidoux pers. comm.). This value is based on 7 years of pumping data from April to October (Rabidoux pers. comm.). In practice, however, many of the agricultural diversions are highest during the high tide, highest during the summer months, and unlikely to divert on a continuous 24-hour flow rate (Rabidoux pers. comm.).

4.1.5.1.2 Proposed BDCP Actions Relevant to the Cache Slough Diversions

The aquatic habitat conservation measures provide for restoration of 65,000 acres of tidal wetland and associated estuarine and upland habitats distributed across the Delta. At least 5,000 acres of this restoration will occur in the Cache Slough Complex.

The Cache Slough Complex has been recognized as providing some of the best functioning existing tidal habitat areas of the Delta. The complex includes Liberty Island, which is likely the best existing

model for freshwater tidal habitat restoration in the Delta for native fishes. The complex supports multiple covered fish species and may be one of the last areas where Delta smelt spawn and rear successfully. Lands sufficient to restore at least 5,000 acres of tidal habitat within the Cache Slough Complex will be acquired as part of the BDCP. Additional lands may be acquired in this Conservation Zone (approximately 21,000 acres in Cache Slough appear suitable for restoration but some of this land is already publicly owned). The Restoration Opportunity Area (ROA) encompasses potential restoration areas that could support covered fish species that use main channels, distributaries, and sloughs. All of the sloughs within the Cache Slough Complex are likely suitable for restoration. Restoring the target amount of freshwater habitat within the Cache Slough Complex and protecting associated upland habitat will benefit multiple covered species and the Delta ecosystem (for details, see Chapter 3, *Conservation Strategy*).

The continued operation of the nonproject diversions located in the Cache Slough Complex will be a covered activity. Incidental take associated with this activity will be minimized by discontinuing some diversions and screening others. The process to evaluate, prioritize, and select diversions for screening will occur through an adaptive management program based on criteria to be determined by NMFS and USFWS. The program will monitor delta smelt presence in the Cache Slough Complex beginning with BDCP implementation and continuing as restoration actions were implemented in the area. If increased delta smelt presence is documented and nonproject diversions occur when the fish are present, then criteria for prioritizing screening the diversions will be established. Guidance from Reclamation's Anadromous Fish Screen Program, DFG's Statewide Fish Screening Policy and Fish Screen Passage Program, and the 1995 Suisun Marsh Diversion Screening Program will be used to establish criteria. Generally, Reclamation's program prioritizes on the basis of size, location, number of species impacted, and cost. DFG's Fish Screen Passage Program prioritizes based on the likelihood and level of impact on federal and state listed endangered species. The Suisun Marsh Program focuses on the magnitude of entrainment of covered species, but has a set of initial criteria which consider diversion location, size, electrical source, commitment of maintenance, and permanency of diversion. Criteria from these programs, which could be used to prioritize diversions in the Cache Slough Complex, are summarized in Table 4-5.

Table 4-5. Summary of Program Criteria for Diversion Screening

Criterion	Example	Program
Diversion diameter size and volume	Diversions with larger diameters receive a higher priority Diversions with a capacity of 250 cfs receive a higher priority	Suisun Marsh Diversion Screening Program DFG Statewide Fish Screening Policy
Location	Diversions located in a waterway that supports the migratory pattern of species (e.g., do not dead end) and has a documented presence of species receives a higher priority.	Suisun Marsh Diversion Screening Program
Diversion addition or modification	New diversions or intakes of existing diversions that are enlarged or relocated receive a higher priority	DFG Statewide Fish Screening Policy
Number of species impacted or biological benefits	More species protected by the screen receive higher priority	Reclamation Anadromous Fish Screen Program
Cooperation of landowners	Diversions located on a cooperative land owner's property receive a higher priority	Suisun Marsh Diversion Screening Program
Permanency of diversion	Diversions that will not be relocated or consolidated receive a higher priority	Suisun Marsh Diversion Screening Program
Cost	N/A	Reclamation Anadromous Fish Screen Program

Current restoration scenarios estimate that in the Cache Slough area, 9 diversions will be removed in the first 10 years of plan implementation and another 15 by the end of the plan term, thereby reducing the total number of diversions covered by the plan from 47 to 23. Which diversions would be removed, has not been determined.

4.1.6 Habitat Restoration, Enhancement, and Management Activities

Habitat restoration, enhancement, and management activities are covered activities, and include all actions that may be undertaken to implement the physical habitat conservation measures described in Chapter 3, *Conservation Strategy*. These activities will be performed in accordance with provisions of Section 3.4.5, Avoidance and Minimization Measures. Types of actions necessary to implement habitat restoration and enhancement conservation measures are anticipated to include, but are not limited to the following actions.

- Grading, excavating, and placement of fill material.
- Breaching, modifying, or removing existing levees and construction of new levees.
- Modifying, demolishing, and removing existing infrastructure (e.g., buildings, roads, fences, electric transmission and gas lines, irrigation infrastructure).
- Constructing new infrastructure (e.g., buildings, roads, fences, electric transmission and gas lines, irrigation infrastructure).
- Removing existing vegetation and planting or seeding of vegetation.

- Controlling the establishment of nonnative vegetation to encourage the establishment of target native plant species.
- Controlling nonnative predator and competitor species (e.g., feral cats, rats, and nonnative foxes).

Habitat management actions include all activities undertaken to maintain the intended functions of protected, restored, and enhanced habitats over the term of the BDCP. Habitat management actions are anticipated to include, but are not limited to the following activities.

- Minor grading, excavating, and filling to maintain infrastructure and habitat functions (e.g., levee maintenance, grading or placement of fill to eliminate fish stranding locations).
- Maintaining infrastructure (e.g., buildings, roads, fences, electric transmission and gas lines, irrigation infrastructure, fences).
- Maintaining vegetation and vegetation structure (e.g., grazing, mowing, burning, trimming).
- Controlling terrestrial and aquatic nonnative plant and wildlife species.

The extent of the habitat and natural communities conservation actions set out in this section and summarized in Table 4-6 reflects both an assessment of the long-term conservation needs of individual covered species (i.e., habitat function, quantity, connectivity, and distribution), and an analysis of existing and future constraints that could affect habitat conservation, including land surface subsidence, habitat values, and land use.

Table 4-6. Extent of Natural Communities and Habitat Types Conserved Over the Term of the BDCP

*[**Note to reviewers:** Acreages provided are subject to change based on results of effects analysis and revisions to conservation strategy]*

Conserved Natural Community/ Habitat Type	Extent of Natural Community and Habitat Type Conserved[1]	
	Protected[2]	Restored
Seasonally Inundated Floodplain	0	10,000
Freshwater and Brackish Tidal, Subtidal, and Transition Habitats	0	65,000
Channel Margin	0	20 linear miles[7]
Riparian	0[4]	5,000[6]
Grassland	8,000[4]	2,000[5]
Nontidal Perennial Emergent Wetland and Nontidal Perennial Aquatic	0[4]	400
Alkali Seasonal Wetland Complex	400	0
Vernal Pool Complex	300	200
Managed Seasonal Wetland	0	TBD
Agricultural Habitat	16,620–32,640	0

[1] All values are in acres unless otherwise noted.

[2] Though not included in the Enhanced column, all protected natural communities/habitat types will also be managed to maintain or increase their habitat functions for covered species.

[3] Enhancement of the existing Yolo Bypass floodplain will be provided with operation of a modified Fremont Weir to increase the duration and frequency of seasonally inundated floodplain habitat. The conditions under which this increased inflow will be provided are described in CM 2 Yolo Bypass Fisheries Enhancement.

[4] An undefined additional extent of these natural communities/habitat types are likely to be protected in small patches where they occur within larger patches of other protected natural communities/habitat types (e.g., existing patches of riparian habitat within preserved agricultural lands will be protected).

[5] Some of the restored grassland may be restored within the transitional component of restored tidal habitat and thus the total land base required for grassland restoration may be less than shown.

[6] Riparian habitat restoration will all occur within the restoration lands for seasonally inundated floodplain, channel margin, and freshwater tidal areas.

[7] This could be up to 40 linear miles through the adaptive management process.

4.1.6.1 Activities to Reduce Effects of Methylmercury Contamination

Activities to reduce methylmercury contamination, which could result in incidental take, are covered activities under the BDCP. These activities are fully detailed in CM 12 Methylmercury Management in Chapter 3, *Conservation Strategy*. These include actions to minimize the methylation of inorganic mercury in BDCP habitat restoration areas. The BDCP Implementation Office will minimize to the extent practicable any increase in mercury methylation associated with habitat restoration conservation measures through the design and implementation of restoration projects. The BDCP Implementation Office will work with DWR and the Central Valley Regional Water Quality Control Board (Central Valley Water Board) to identify and implement methods for minimizing the methylation of mercury in BDCP restoration areas.

4.1.6.2 Activities to Reduce Predation and Other Sources of Direct Mortality

Activities to reduce predation and other sources of direct mortality that could result in incidental take are covered activities under BDCP. These conservation measures are fully detailed in Chapter 3, *Conservation Strategy.*

- CM 13 Nonnative Aquatic Vegetation Control. The BDCP Implementation Office will control the growth of Brazilian waterweed (*Egeria densa*), water hyacinth (*Eichhornia crassipes*), and other nonnative submerged aquatic vegetation and floating aquatic vegetation in BDCP tidal habitat restoration areas.
- CM 15 Predator Control. The BDCP Implementation Office will reduce the local effects of predators on covered fish species by conducting focused predator control using a variety of methods in locations in the Delta that are known to have high densities of predators (predator hot spots).
- CM 16 Nonphysical Fish Barriers. The BDCP Implementation Office will install nonphysical barriers at the junction of channels with low survival of outmigrating juvenile salmonids to deter fish from entering these channels.

4.1.6.3 Adaptive Management and Monitoring Program

As described in Chapter 3, various types of monitoring activities will be conducted during BDCP implementation, including preconstruction surveys, construction monitoring, compliance monitoring, effectiveness monitoring, and system monitoring. These activities are detailed in Section 3.5, *Adaptive Management and Monitoring Program*, and will be further detailed as necessary in monitoring protocols to be developed in association with and approved by the state and federal fish and wildlife agencies. In addition, focused research will be undertaken or contracted to develop information necessary to better inform BDCP implementation. All such research actions will be undertaken in consultation with and approved by the state and federal fish and wildlife agencies. Such monitoring and research activities could result in incidental take and these activities are covered activities under BDCP.

4.1.6.4 Other Conservation Actions

All conservation actions included in Chapter 3, *Conservation Strategy,* that could result in incidental take, not described above, are covered activities. Incidental take as a result of these activities is are expected to be minor, as detailed in Chapter 5, *Effects Analysis*. These conservation measures include the following.

- CM 14 Stockton Deep Water Ship Channel Dissolved Oxygen Levels. The BDCP Implementation Office will continue to operate and maintain an existing oxygen aeration facility in the Stockton Deep Water Ship Channel, which serves to increase dissolved oxygen concentrations and thereby minimize a potential fish passage barrier.
- CM 18 Conservation Hatcheries. The BDCP Implementation Office will support the development of a delta and longfin smelt conservation hatchery by the USFWS to house a delta smelt refugial population and provide a source of delta and longfin smelt for supplementation or reintroduction, if deemed necessary by federal and state fish and wildlife agencies. The Implementation Office will also support the expansion of the refugial population of delta smelt

and establishment of a refugial population of longfin smelt at the University of California, Davis Fish Conservation and Culture Laboratory to serve as a population safeguard in case of a catastrophic event in the wild.

4.2 Federal Actions Associated with the BDCP

The activities described in this section have been designated as federal actions associated with the BDCP. These actions consist of CVP-related activities within the Delta that are authorized, funded, or carried out by Reclamation. These federal actions differ from covered activities, which encompass those BDCP actions that are the responsibility of non-federal entities. The associated federal actions associated with the BDCP are subject to the ESA Section 7 consultation process; as such, Reclamation will consult with USFWS and NMFS regarding the effect of these actions on listed species and designated critical habitat. For the federal actions set out in this section, the BDCP is intended to provide the basis for a BA to support Section 7 consultations with the federal fish and wildlife agencies. Reclamation's actions that are outside the scope of the BDCP will be addressed as part of a consultation that covers the totality of CVP-related operations.

The CVP's Delta Division[6] facilities in the Plan Area consist of the Delta Cross Channel, the eastern portion of the Contra Costa Canal, including the Contra Costa Water District's (CCWD) diversion facility at Rock Slough; the Jones Pumping Plant (formerly Tracy Pumping Plant), the Tracy Fish Collection Facility, and the northern portion of the Delta Mendota Canal (Figures 4-1 and 4-2). These CVP facilities are used to convey water from the Sacramento River in the north Delta to the south Delta and to export that water from the Delta into canals and pipelines that carry it to agricultural and municipal and industrial contractors to the south and west of the Delta. These facilities are integral components of the CVP and contribute to the functional capacity of the overall system. This section describes these facilities, their operational requirements, and the actions necessary to maintain their viability. The operation and maintenance of these facilities are not only integral to the water supply system, but are also important to the BDCP conservation strategy and the protection and conservation of the aquatic ecosystem and covered fish species.

The existing CVP facilities described in this section will be operated under both the BDCP near-term and long-term implementation, but with differing operating criteria following completion of new facilities. The BDCP near- and long-term operational criteria and adaptive operational range are described in Chapter 3, *Conservation Strategy*, and include descriptions of operations of CVP facilities in the Plan Area.

All operations and maintenance of CVP facilities described in this section are federal actions associated with the BDCP and the effects of those actions are addressed by the BDCP conservation strategy (Chapter 3, *Conservation Strategy* and Chapter 5, *Effects Analysis*) and will be covered in the BDCP Section 7 consultation.

[6] The Delta Division is one of several CVP divisions covering various geographical areas and facilities of the CVP including the American River, Friant, East Side, Sacramento River, San Felipe, West San Joaquin, and Shasta/Trinity River divisions. The CVP Delta Division includes facilities within the Plan Area (described in this chapter) and facilities outside the Plan Area (not included in this chapter).

4.2.1 Delta Cross Channel

The Delta Cross Channel is a gated diversion channel between the Sacramento River, near Walnut Grove, and Snodgrass Slough (Figure 4-1). Flows into the Delta Cross Channel from the Sacramento River are controlled by two 60-foot-by-30-foot radial gates. When the gates are open, water flows from the Sacramento River through the cross channel to Snodgrass Slough and from there to channels of the lower Mokelumne River and into the central Delta. Once in the central Delta, the water is conveyed primarily via Old and Middle rivers to the Jones Pumping Plant by the draw of the pumps. The Delta Cross Channel operation improves water quality in the interior Delta by improving circulation patterns of good quality water from the Sacramento River towards Delta diversion facilities.

Reclamation operates the Delta Cross Channel in the open position to achieve the following benefits.

- Improve the transfer of water from the Sacramento River to the export facilities at the SWP Banks (see description of SWP facilities) and CVP Jones Pumping Plants.
- Improve water quality in the southern Delta.
- Reduce saltwater intrusion rates in the western Delta.

During the late fall, winter, and spring, the gates are often periodically closed to protect out-migrating salmonids from entering the interior Delta where they are subject to higher levels of predation and greater potential for entrainment at the CVP and SWP south Delta export facilities. When flows in the Sacramento River at Sacramento reach 20,000 to 25,000 cfs (on a sustained basis) the gates are closed to reduce potential scouring and flooding that might occur in the channels on the downstream side of the gates.

See Chapter 3, *Conservation Strategy,* for a description of operations of the Delta Cross Channel gates under the BDCP to provide for protection of salmon in conjunction with water conveyance. Reclamation is seeking ESA Section 7 authorization for all operations and maintenance of the Delta Cross Channel consistent with BDCP conservation measures.

4.2.2 C.W. Jones Pumping Plant

The CVP and SWP use the Sacramento River, San Joaquin River, and Delta channels to transport water to pumping plants located in the south Delta (Figures 4-1 and 4-2). The CVP's Jones Pumping Plant, about 5 miles northwest of Tracy, consists of six available pumps. The Jones Pumping Plant is located at the end of an earth-lined intake channel about 2.5 miles in length. The Jones Pumping Plant has a physical capacity of 5,100 cfs and the State Water Board-permitted diversion capacity of 4,600 cfs with maximum pumping rates ranging from 4,500 to 4,300 cfs during the peak of the irrigation season and approximately 4,200 cfs during the winter nonirrigation season until construction and full operation of the proposed Delta Mendota Canal/California Aqueduct Intertie. The wintertime physical constraints on the Jones Pumping Plant operations are the result of a Delta Mendota Canal freeboard constriction near O'Neill Forebay, O'Neill Pumping Plant capacity, and the current water demand in the upper sections of the Delta Mendota Canal.

See Chapter 3, *Conservation Strategy*, for description of south Delta operations of SWP and CVP and SWP under the BDCP to provide for protection of covered fish species in conjunction with water conveyance and diversion. Reclamation is seeking ESA Section 7 authorization on all operations and maintenance of the Jones Pumping Facility not otherwise restricted by the BDCP operating criteria.

4.2.3 Tracy Fish Collection Facility

At the head of the intake channel leading to the Jones Pumping Plant, Tracy Fish Collection Facility louver screens intercept fish that are then collected, held, and transported by tanker truck to Delta release sites away from the south Delta facilities. The Tracy Fish Collection Facility uses behavioral barriers consisting of primary and secondary louvers to guide entrained fish into holding tanks. The primary louvers are located in the primary channel just downstream of the trashrack. The secondary louvers are located in the secondary channel just downstream of the traveling water screen. The louvers allow water to pass through onto the Jones Pumping Plant but the openings between the slats are tight enough and angled against the flow of water in such a way as to prevent most fish from passing between them and instead enter one of four bypass entrances along the louver arrays. The holding tanks on hauling trucks used to transport salvaged fish to release sites are injected with oxygen and contain an eight parts per thousand salt solution to reduce stress on fish. The CVP uses two release sites, one on the Sacramento River near Horseshoe Bend and the other on the San Joaquin River immediately upstream of the Antioch Bridge.

Reclamation is seeking ESA Section 7 authorization for all operations and maintenance of the Tracy Fish Collection Facility consistent with the BDCP operating criteria.

4.2.4 Contra Costa Water District Diversion Facilities

The CCWD diverts water from the Delta for irrigation and municipal and industrial uses under CVP contract and under its own water rights. Under its CVP contract, CCWD can divert water at Rock Slough for direct use and divert water at its intake on Old River near State Route (SR) 4 (designated CCWD's Old River Intake) and its new intake on Victoria Canal near Middle River (designated CCWD's Middle River Intake) for either direct use or for storage. Under its own State Water Board permit and license, CCWD can divert water for direct use at Mallard Slough, and under its own Los Vaqueros water right permit, CCWD can divert water at its Old River and Middle River intakes for storage in Los Vaqueros Reservoir.

CCWD's water system includes intake facilities at Mallard Slough, Rock Slough, Old River, and Victoria Canal near Middle River (Middle River intake); the Contra Costa Canal and shortcut pipeline; Contra Loma Reservoir; the Martinez Terminal Reservoir; and the Los Vaqueros Reservoir. The Rock Slough intake facilities, the Contra Costa Canal, the shortcut pipeline, the Contra Loma Reservoir, and the Martinez Terminal Reservoir are owned by Reclamation, and operated and maintained by CCWD under contract with Reclamation. Mallard Slough Intake, Old River Intake, Middle River Intake (on Victoria Canal), and Los Vaqueros Reservoir are owned and operated by CCWD.

CCWD's operations are governed by BOs issued to Reclamation under separate Section 7 consultations (hereafter, CCWD-specific BOs). CCWD's operations are included in the project description and modeling for the long-term SWP/CVP operations BA, which resulted in the current BOs on SWP/CVP operations (U.S. Fish and Wildlife Service 2008, National Marine Fisheries Service 2009). CCWD also has CESA take authorization for all its operations under a 2081 permit issued in 2009 by DFG.

Reclamation and CCWD are currently planning two projects to modify facilities: addition of a fish screen to the Rock Slough Intake and expansion of the Los Vaqueros Reservoir. For each of these

projects, Reclamation, in coordination with CCWD, consulted with USFWS and NMFS under Section 7, and CCWD, in coordination with Reclamation, has consulted with DFG.[7]

4.2.4.1.1 Rock Slough Fish Screen

The Rock Slough Intake is located about four miles southeast of Oakley, where water flows into the earth-lined portion of the Contra Costa Canal. This section of the canal is open to tidal influence and continues for four miles to Pumping Plant 1, which has capacity to pump up to 350 cfs into the concrete-lined portion of the canal. Prior to completion of the Los Vaqueros Project in 1997, this was CCWD's primary diversion point. Consistent with the CVPIA and as required by the USFWS BO for the Los Vaqueros Project (U.S. Fish and Wildlife Service 1993), Reclamation, in collaboration with CCWD, is in the process of constructing a fish screen at the Rock Slough intake. This project is covered by a separate ESA Section 7 consultation. With the completion of this project, all of CCWD's Delta intakes will include positive barrier fish screens. CCWD's other intakes (Mallard Slough, Old River and the new Middle River intake on Victoria Canal) are screened.

4.2.4.1.2 Los Vaqueros Reservoir Expansion Project

CCWD has certified the environmental documents for an expansion of Los Vaqueros Reservoir from its current 100,000 af to 160,000 af. CCWD is in the process of completing permits and final design, and expects to begin construction in 2011, with completion of the expansion in 2012. The expansion will improve CCWD water quality, water supply reliability and emergency storage, and will have the effect of shifting CCWD diversions from drier periods to wetter periods. The expansion will not increase CCWD overall diversions from the Delta or modify any Delta facilities; operation of the expanded reservoir will continue to be governed by existing CCWD-specific BOs. The expansion will impact terrestrial habitat and species within the Los Vaqueros watershed, which is outside of the Delta; CCWD and Reclamation are currently consulting with USFWS (under Section 7) to develop a BO covering the terrestrial impacts, mitigation, and adaptive management, separate and independent from the BDCP Section 7 consultation.

4.2.4.2 Covered Action

Reclamation will include CCWD's operations described above in the BDCP ESA Section 7 BA as part of the existing operations. CCWD is not an ESA Section 10 permit applicant under BDCP, and operation of CCWD facilities will not change under the BDCP. However, all operations and maintenance of CCWD facilities described in this section that could affect species or modify designated critical habitat protected under ESA will be included in the analysis of Delta operations in the BDCP Section 7 BA. This will ensure that existing and ongoing operations in the Delta are accurately analyzed in the consultation on the effects of the BDCP and CVP operations. If, as a result of the BDCP ESA Section 7 consultation, any of the criteria for reinitiation of consultation set forth in the CCWD-specific BOs are triggered, Reclamation and CCWD will reinitiate consultation under ESA Section 7.

4.2.5 CVP Diversions

The volume of water delivered by the CVP is and will continue to be variable, but in any year will be equal to the amount of water that is hydrologically available and that can be diverted under current

[7] For the Los Vaqueros project, consultation has been initiated but not completed.

contractual rights consistent with the terms and conditions of the BDCP conservation strategy and then-existing permits and regulations. Reclamation delivers water transported through facilities in the Delta to senior water rights contractors, long-term CVP water service contractors, refuges and waterfowl areas, and temporary water service contractors south of the Delta. The total volume under contract, including Level 2 refuge supplies, is approximately 3.3 million af. Additionally, the CVP provides Level 4 refuge water totaling approximately 100,000 af. In addition, as part of the San Joaquin River Restoration Program implementation, Reclamation anticipates submitting a petition to add a point of diversion to the State Water Board to allow rediversion of the restoration flows either upstream of or in the Delta. Moreover, in wet hydrologic conditions when CVP storage is not available, Delta is in excess conditions, water is made available under temporary contracts for direct delivery. The volume of water available for conveyance through the Delta is a result of hydrologic conditions, upstream reservoir operations, upstream demands, regulatory constraints on CVP operations, and from transfers of water from upstream water users to south of Delta water users.

See Chapter 3, *Conservation Strategy,* for description of near-term and long-term operations and adaptive range of CVP and SWP under the BDCP to provide for protection of covered fish species in conjunction with water conveyance and diversion. All CVP diversions described in this section are federal actions associated with the BDCP and will be covered in the BDCP Section 7 consultation. Water passing through the Delta associated with water transfers (e.g., Drought Water Bank and Dry Year Water Purchase Programs) is also a covered action. Reclamation is seeking ESA Section 7 authorization for all CVP diversions consistent with the BDCP operating criteria.

4.2.6 Associated Maintenance and Monitoring Activities

Maintenance and replacement means those activities that maintain the capacity and operational features of the existing CVP water diversion and conveyance facilities described above including the Delta Cross Channel, Jones Pumping Plant, Tracy Fish Collection Facility, and Contra Costa Diversion Facilities. Maintenance activities include maintenance of electrical power supply facilities; maintenance as needed to ensure continued operations and replacement of facility or system components when necessary to maintain system capacity and operational capabilities; and upgrades and technological improvements of facilities to maintain system capacity and operational capabilities.

Monitoring activities refer to those actions necessary for monitoring water quality and fisheries as conditioned by water rights permits and biological opinions, those actions undertaken as a result of the CVPIA and agreements, and any additional monitoring under the BDCP as described in Chapter 3, *Conservation Strategy*, for which Reclamation is responsible. These actions include routine daily, annual or other periodic sampling of water quality constituents as well as trawls for various fish species in the Delta (including actions associated with the Interagency Ecological Program). Reclamation currently operates and maintains more than 20 monitoring stations in the Delta which provide near-realtime water quality data. As the BDCP conservation strategy is implemented, the nature of, and requirements for, monitoring will be expected to change.

All CVP maintenance and monitoring described in this section are federal actions associated with the BDCP and will be covered in the Section 7 consultation.

4.3 Joint Federal and Nonfederal Actions

This section describes activities that will be carried out jointly by DWR and Reclamation. These actions are categorized as covered activities under ESA Section 10 and NCCPA Section 2835 for DWR because of DWR's involvement in these joint actions. The activities identified in this section for federal actions by Reclamation are not covered activities for the purposes of the ESA Section 10(a)(1)(b) permit. These federal actions are actions that occur within the Delta that will be coordinated with DWR to support DWR's compliance with the ESA Section 10 permit. Reclamation's activities are subject to ESA Section 7, and Reclamation will consult under ESA Section 7 on those actions. The Section 7 consultation will also include other CVP operations that are not within the Plan Area.

4.3.1 Joint Point of Diversion Operations

Under State Water Board Decision 1641 (D-1641) (December 1999, revised March 2002), Reclamation and DWR are authorized to use/exchange diversion capacity between the SWP and CVP to enhance the beneficial uses of both projects. The use of one project's diversion facility by the other project is referred to as the Joint Points of Diversion (JPOD). There are a number of requirements in D1641 that restrict JPOD to protect water quality and fishery resources.

In general, JPOD capabilities are used to accomplish four basic SWP and CVP objectives:

- When wintertime excess pumping capacity becomes available during Delta excess conditions and total SWP/CVP San Luis storage is not projected to fill before the spring pulse flow period, the project with the deficit in San Luis storage may elect to use JPOD capabilities.
- When summertime pumping capacity is available at Banks Pumping Plant and CVP reservoir conditions can support additional releases, the CVP may elect to use JPOD capabilities to enhance annual CVP south of Delta water supplies.
- When summertime pumping capacity is available at Banks or Jones Pumping Plant to facilitate water transfers, JPOD may be used to further facilitate the water transfer.
- During certain coordinated SWP/CVP operation scenarios for fishery entrainment management, JPOD may be used to shift SWP/CVP exports to the facility with the least fishery entrainment impact while minimizing export at the facility with the most fishery entrainment impact.

All in-Delta JPOD operations are included as either covered activities or federal actions associated with the BDCP and the effects of those activities and actions are addressed by the BDCP (Chapter 3, *Conservation Strategy* and Chapter 5, *Effects Analysis*). Those actions associated with Reclamation will receive authorization through the ESA Section 7 consultation process and those actions associated with DWR will be covered under ESA Section 10 permits and Section 2835 permits issued pursuant to the NCCPA.

4.3.2 Operations of New Water Intake and Conveyance Facilities

DWR will own and operate the new intake and conveyance facilities and their operations will be covered activities as described in Section 4.2.2, *New Facilities Construction, Operation, and Maintenance*. Reclamation and/or the CVP Contractors will enter into agreements to wheel CVP

water through the new facilities and this action by Reclamation will be an associated federal action. All operations of new intake and conveyance facilities are included as either covered activities or federal actions associated with the BDCP. Those actions associated with Reclamation will receive authorization through the ESA Section 7 consultation process and those actions associated with DWR will be covered under ESA Section 10 permits and Section 2835 permits issued pursuant to the NCCPA.

4.3.3 Transfers

State and federal laws governing water use in California promote the use of water transfers to manage water resources, particularly water shortages, provided that certain conditions of transfer are adopted to protect source areas and users. Transfers requiring export from the Delta are conducted at times when pumping and conveyance capacity at the SWP or CVP export facilities is available to move the water. Additionally, operations to accomplish these transfers must be carried out in coordination with SWP and CVP operations, such that the capabilities of the projects to exercise their own water rights or to meet their legal and regulatory requirements are not diminished or limited in any way.

SWP and CVP contractors have independently acquired water and arranged for its pumping and conveyance through SWP facilities. State Water Code provisions grant other parties access to unused conveyance capacity, although SWP contractors have priority access to capacity not being used by DWR to meet SWP contract amounts.

4.3.4 Suisun Marsh Facilities Operations and Maintenance

The existing Suisun Marsh facilities consist of the following elements.

- Suisun Marsh Salinity Control Gates.
- Morrow Island Distribution System.
- Roaring River Distribution System.
- Goodyear Slough Outfall.
- Various salinity monitoring and compliance stations throughout the Marsh.

Since the early 1970s, the California Legislature, State Water Board, Reclamation, DFG, Suisun Resource Conservation District (SRCD), DWR, and other agencies have engaged in efforts to preserve beneficial uses of Suisun Marsh to mitigate for potential impacts on salinity regimes associated with reduced freshwater flows to the marsh. Initially, salinity standards for Suisun Marsh were set by the State Water Board's Decision 1485 to protect alkali bulrush production, a primary waterfowl plant food. Subsequent standards set under the State Water Board's Decision-1641 reflect the intention of the State Water Board to protect multiple beneficial uses. A contractual agreement between DWR, Reclamation, DFG, and SRCD includes provision for measures to mitigate the effects of SWP and CVP operations and other upstream diversions on Suisun Marsh channel water salinity. The Suisun Marsh Preservation Agreement requires DWR and Reclamation to meet specified salinity standards, sets a timeline for implementing the Plan of Protection, and delineates monitoring and mitigation requirements.

The existing operation of the Suisun Marsh Facilities is covered for ESA and CESA compliance under the Operations Criteria and Plan (OCAP) BOs and the related consistency determination. The Suisun

Marsh Facilities will be covered under the BDCP for existing operations criteria and for future criteria discussed below.

The BDCP includes conservation actions that will change land use and water operations in Suisun Marsh over time. These changes in land use and water operations are covered activities and are addressed by the BDCP. See Chapter 3, *Conservation Strategy,* for descriptions of tidal brackish marsh restoration (CM 4 Tidal Habitat Restoration) and water operations (CM 1 Water Facilities and Operations*)*. The existing operation and maintenance of the Suisun Marsh Salinity Control Gates and other facilities will not change until BDCP actions require changes in their operation. Operations of the Suisun Marsh Facilities under the existing operational criteria, as well as changes to operation as described in CM 1 will be covered by BDCP. Generally, as habitat restoration in Suisun Marsh is conducted with the implementation of BDCP conservation measures, and changes in land uses occur, the operation of the Suisun Marsh Salinity Control Gates will trend towards limiting the operation of the gates and increasing the period during which the gates allow tidal inflows into Montezuma Slough to provide for the conservation of covered fish species in conjunction with all other water operations under the BDCP.

The BDCP covers operations of the Salinity Control Gates and other Suisun Marsh facilities under the existing and future operational criteria and future construction and maintenance of tidal habitat in Suisun Marsh identified in CM 1 and CM 4 in Chapter 3, *Conservation Strategy*. These activities and actions are included as covered activities and associated federal actions. Those actions associated with Reclamation will receive authorization through the ESA Section 7 consultation process and those actions associated with DWR will be covered under ESA Section 10 permits and Section 2835 permits issued pursuant to the NCCPA.

4.4 References Cited

4.4.1 Printed References

Alexander, B.S., G.H. Mendell, and G. Davidson. 1874. Report of the Board of Commissioners on the Irrigation of the San Joaquin, Tulare, and Sacramento Valleys of the State of California. Government Printing Office, Washington D.C.

Bureau of Reclamation. 2008. Central Valley Project and State Water Project Operations Criteria and Plan Biological Assessment. May.

Bureau of Reclamation. 2010. Central Valley Project Improvement Act. Last revised: June 29, 2010. Available: <http://www.usbr.gov/mp/cvpia/index.html>. Accessed: November 6, 2011.

Bureau of Reclamation. 2011. Central Valley Project. Last revised: April 11, 2011. Available: <http://www.usbr.gov/projects/Project.jsp?proj_Name=Central%20Valley%20Project>. Accessed: November 6, 2011.

California Department of Water Resources. 2008. California State Water Project and the Central Valley Project. Last revised: April 29, 2008. Available: < http://www.water.ca.gov/swp/cvp.cfm>. Accessed: November 6, 2011.

California Department of Water Resources. 2010. California State Water Project Overview. Last revised: August 11, 2010. Available: < http://www.water.ca.gov/swp/>. Accessed: November 6, 2011.

Department of Public Works. 1930. The State Water Plan. Public works Bulletin No. 25. A Report to the Legislature of 1931. Sacramento, CA.

Lund, J., E. Hanak, W. Fleenor, R. Howitt, J. Mount, P. Moyle. 2007. Envisioning futures for the Sacramento-San Joaquin Delta. San Francisco, CA, Public Policy Institute of California.

National Marine Fisheries Service. Biological and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project. National Marine Fisheries Service, Southwest Region, Long Beach, California. June.

Solano County Water Agency. 2011. N11.Cache Slough Ag Intakes Excel File. Provided by David Okita via email. September 30.

U.S. Fish and Wildlife Service. Formal Consultation on Effects of the Proposed Los Vaqueros Reservoir Project on Delta Smelt, U.S. Fish and Wildlife Service, Sacramento, California, September.

U.S. Fish and Wildlife Service. 2008. Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP). December 15, 2008.

4.4.2 Personal Communications

Rabidoux, Alex. Water Resources Engineer. Solano County Water Agency. Personal Communication – Email. September 30, 2011.